Plant Archives Vol. 19, Supplement 1, 2019 pp. 1366-1368 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF IRRIGATION PRACTICES ON THE GROWTH AND YIELD ATTRIBUTES AND YIELD OF RICE (*ORYZA SATIVA* L.)

Murugan, G.; M.S. Bhagavathi, K. Suseendran, P. Stalin and M. Saravana perumal
Department of Agronmy, Faculty of Agriculture, Annamalai University
Annamalai Nagar 608002, Tamil Nadu.

Abstract

A field experiment was conducted to find out the effect of different irrigation practices in rice establishment methods at Annamalai University Experimental Farm, Annamalai Nager, during *Navari* season (Jan - Apr), 2016. Nine treatments combinations were studied in RBD with three replications. The treatments comprised of direct dry seeded rice, direct wet seeded rice and manual transplanted rice with flooding throughout the crop growth, saturation up to panicle initiation and alternate wetting and drying. All treatments significantly influenced the crop growth and yield components and yield of rice. The highest growth parameters viz., plant height, no. of tillers per hill, leaf area index, yield attributes viz., no of panicles per hill, no of filled grains per panicle, grain yield and straw yield by the treatment manual transplanting with flooding throughout the crop growth (T_7). The least growth and yield attributes and yield were obtained with direct dry seeded rice with alternate wetting and drying.

***Key word*:** Rice, irrigation, weeds.

Introduction

In India, rice is the staple food for millions of people and plays a vital role in the economy. It is grown in an area of 44 m. ha with the production of 108 m.t Rice is being grown in an area on 1.93 m. ha with an annual production of 6.61 m. t in Tamil Nadu. The average rice productivity in India and Tamil Nadu were 2.12 and 3.07 t. ha^{-1} as against 6.1 and 3.7 t ha. for china and the world, respectively (Anonymous, 2011). The reasons for low rice yield in India and particularly in Tamil Nadu are many and diverse in nature. The methods of growing rice, heavy infestation of weeds, inefficient utilization of applied nitrogen, ill effects of cloudy weather on the photosynthetic activity of rice plant in monsoon season and adverse soil condition such as salinity and alkalinity are some of the factors that seriously impede the overall production of rice in our country.

Direct dry seeded rice is a faster and easier sowing methodology reduces the labour, earlier crop maturity by 7-10 days and higher tolerance of water deficit (Balasubramanian and Hill, 2002). A major impediment in the successful cultivation of direct- seeded rice (DSR) in tropical countries is heavy infestation of weed which often ranges from 50-91 per cent (Paradkar *et al.,* 1997). However weeds are the main biological constraints to the production of DSR (Rao *et al.,* 2007) which may causes 60-80 per cent reduction in grain yield of rice.

Among the establishment methods of rice in our country, transplanting has been the major method of establishment in-spite of the fact that it requires more labour about 250-300 man hrs ha^{-1} which is roughly 25 per cent of total requirement of the crop (Singh and Hussain, 1983). The common problems associated with the rice transplantation by hired labour are lower plant population per unit area, improper fixation of nursery plants in the soil, a higher per cent of missing plants and uneven transplantation in paddy fields, i.e., dense and thin planted patches in the field (Umar Farooq *et al.,* 2001). Further, due to rapid industrialization and migration to urban areas, the availability of labour become very scarce and hike in the wages of labour, manual transplanting found costly leading to reduce the profits to farmers.

Materials and Method

The field experiment was conducted to study irrigation practices in different rice ecosystems at Annamalai University Experimental Farm, Annamalai Nagar, during *Navari* season, 2016. Nine treatment combinations were studied in RBD with three replications. The rice variety chosen for the experiment was ADT 43 with a spacing of 15×10cm. Statistical analysis was carried out as per the procedure suggested by Panse and Sukhatme (1978).

Flooding the plots throughout the crop growth were irrigated to maintain an uniform standing water column of 5 cm throughout the crop duration, saturation upto panicle initiation plots were maintained with 5 cm water column upto panicle initiation stage, alternate wetting and drying plots were irrigated to maintained 5 cm alternately. Irrigation was with held and water from the field was drained 10 days before harvesting.

Result

Manual transplanting with flooding throughout the crop growth (T_7) recorded the highest plant height (harvest stage) of 107.36 cm, number of tillers hill^{-1} of 19.50 and leaf area index of 6.98. The next best treatment was T_8- Manual transplanting with saturation up to panicle initiation which was on par with the treatment T_4- Direct wet seeded rice with flooding throughout the crop growth. The plant height, number of tillers hill^{-1} and leaf area index were least in T_3-Direct dry seeded rice with alternate wetting and drying.

Among the various treatments compared, manual transplanting with flooding throughout the crop growth recorded the highest number of panicles hill^{-1} of 8.98 and 85.98 filled grains panicle^{-1}. The next best treatment was T_8-Manual transplanting with saturation up to panicle initiation and it was on par with the treatment T_4- Direct wet seeded rice with flooding throughout the crop growth. The least number of panicles hill^{-1} was recorded in T_3-Direct dry seeded rice with alternate wetting and drying with the value of 4.01. The treatment manual transplanting with flooding throughout the crop growth (T_7) recorded the highest grain yield of 5590 and straw yield of 8762. The next best treatment was T_8-Manual transplanting with saturation up to panicle initiation and it was on par with the treatment T_4-Direct wet seeded rice with flooding throughout the crop growth. The lowest grain and straw yield were registered in treatment T_3- Direct dry seeded rice with alternate wetting and drying.

Discussion

Transplanting of rice seedling registered higher growth attributes of rice when compared to sowing of direct seeded rice (wet and dry). The possible reason might be the better and prolonged control of weeds, increased plant height LAI, and dry matter production of rice crop to produce superior yield attributes characters *viz.,* number of panicle clump^{-1}, number of filled grains panicle^{-1} and thereby yield of transplanted rice. Transplanting the rice seedling along with applications of flooding irrigation recorded highest yield attributes and yield of rice. This may be due to efficient weed control throughout the critical period of competition and sustained nutrient availability leads to better uptake of NPK by the crop might have contributed to synchronous tillering and spikelet formation leading to higher number of panicle m^{-2} and higher post flowering photosynthesis and assimilating partitioning to the sink, ultimately contributing to production of higher number of filled grains panicle^{-1}. It is logic to postulate that the increased yield attributes had a favourable effect on source and sink capacity resulting in increased grain and straw yields. Hence, the yield level of grain and straw fell in line with treatments that performed well in the earlier days (Schnier *et al.,* 2000)

Table 1 : Effect of irrigation practices on the growth characters of rice

Treatments	Plant height at Harvest (cm)	Number of tillers hill^{-1}	Leaf area index
T-1 Direct dry seeded rice with flooding throughout the crop growth.	87.42	13.53	4.64
T-2 Direct dry seeded rice with saturation upto panicle initiation.	84.57	13.02	4.38
T-3 Direct dry seeded rice with alternate wetting and drying.	80.95	11.32	3.76
T-4 Direct wet seeded rice with flooding throughout crop growth.	100.78	17.35	5.98
T-5 Direct wet seeded rice with saturation upto panicle initiation.	94.21	15.26	5.32
T-6 Direct wet seeded rice with alternate wetting and drying.	91.36	14.67	5.12
T-7 Manual transplanting with flooding throughout the crop growth.	107.36	19.50	6.98
T-8 Manual transplanting with saturation upto panicle initiation.	103.62	17.89	6.12
T-9 Manual transplanting with saturation upto panicle initiation.	98.15	16.91	5.86
S.Ed	1.78	0.32	0.17
CD(P=0.05)	3.56	0.64	0.35

Table 2 : Effect of irrigation practices on the yield characters

Treatments	No. of panicles hill^{-1}	Number of filled grains panicle^{-1}
T-1 Direct dry seeded rice with flooding throughout the crop growth.	5.24	75.85
T-2 Direct dry seeded rice with saturation upto panicle initiation.	4.78	74.79
T-3 Direct dry seeded rice with alternate wetting and drying.	4.01	71.92
T-4 Direct wet seeded rice with flooding throughout crop growth.	7.68	82.71
T-5 Direct wet seeded rice with saturation upto panicle initiation.	6.49	79.83
T-6 Direct wet seeded rice with alternate wetting and drying.	6.05	78.67
T-7 Manual transplanting with flooding throughout the crop growth.	8.98	85.98
T-8 Manual transplanting with saturation upto panicle initiation.	8.12	83.74
T-9 Manual transplanting with saturation upto panicle initiation.	7.32	81.96
S.Ed	0.24	0.78
CD(P=0.05)	0.49	1.56

Table 3 : Effect of irrigation practices on the grain and straw yield of rice

Treatments	Grain yield	Straw yield
T-1 Direct dry seeded rice with flooding throughout the crop growth.	4398	7141
T-2 Direct dry seeded rice with saturation upto panicle initiation.	4257	6920
T-3 Direct dry seeded rice with alternate wetting and drying.	3970	6550
T-4 Direct wet seeded rice with flooding throughout crop growth.	5226	8139
T-5 Direct wet seeded rice with saturation upto panicle initiation.	4835	7694
T-6 Direct wet seeded rice with alternate wetting and drying.	4694	7455
T-7 Manual transplanting with flooding throughout the crop growth.	5590	8762
T-8 Manual transplanting with saturation upto panicle initiation.	5371	8356
T-9 Manual transplanting with saturation upto panicle initiation.	5089	7992
S.Ed	92.5	132.5
CD(P=0.05)	185	265

Reference

Anonymous. 2011. www.tn.nic.in

Balasubramanian, V. and Hill, J.E. (2002). Efficiency of N and K combinations on nutrient uptake and productivity of IR 50 rice with varying populations. Madras Agric. J. 79(11): 628-634.

Paradkar, M.R.; Kurchania, S.P. and Tiwar, J.P. (1997). Chemical control of *Parthenium hysterophorus* and other associated weeds in upland drilled rice. Indian J. Weed Sci., 29: 151-154.

Rao, A.N.; Johnson, D.E.; Sivaprasad, B.; Ladha, J.K. and Mortimer, A.M. (2007). Weed management indirect-seeded rice Advin Agron, 93:153-225.

Singh, G. and Hussain, U.K. (1983). Modification and testing of a manual rice transplanters Agricultural Mechanization in Asia, Africa and Latin America, 14: 25-30.

Umer, F.; Sheikn, A.D.; Muhammad, I. and Arshed, B.Z.A. (2001). Diffusion possibilities of mechanical rice transplanters Int. J. Agric. Biol. 3: 7-20.

Schiner, H.F.; Govindrasingh, S.P.; Singh, S.P.; Singh, A.; Kumar, G.; Sharma, M.K.; Singh, M.; Mortimer, M. and Johnson, D.E. (2000). Effect of weed management and crop Establishment method on weed dynamics and grain yield of rice. Indian J. weed Sci., 38(1&2): 20-24.

Panse, V.G. and Sukhatme, P.V. (1978). Statistical method of agricultural works. ICAR, New Delhi, 3rd ed.